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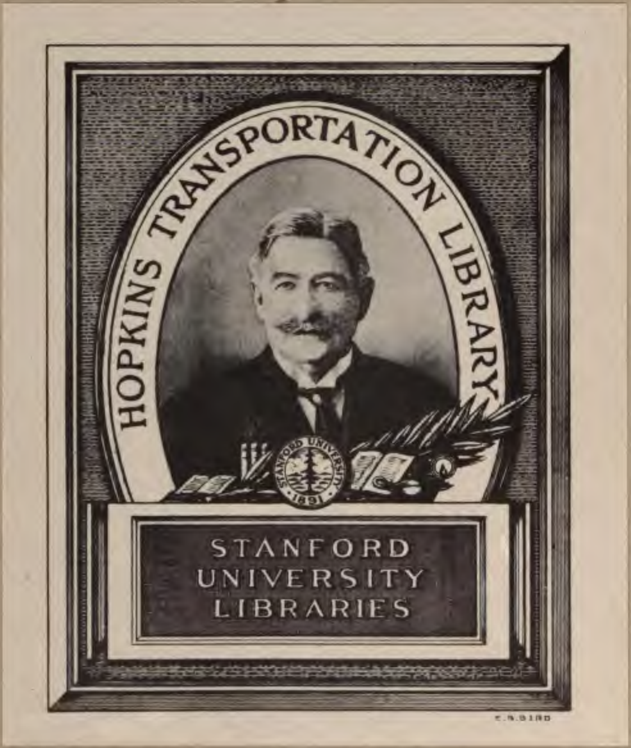

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OBSERVATIONS ON STEAM TACTICS AND ROWING-BOAT EVOLUTIONS.

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OBSERVATIONS ON STEAM TACTICS AND ROWING-BOAT EVOLUTIONS

BY VICE-ADMIRAL W. F. MARTIN

SUPPLIED FOR THE PUBLIC SERVICE

LONDON: B. M. PICKERING
FOR PRIVATE CIRCULATION
1858

OBSERVATIONS

ON THE TACTICS OF STEAM SQUADRONS,

AND ON THE MANAGEMENT OF FLOTILLAS OF ROWING-BOATS.

IN these observations, it is proposed to furnish principles by which to conduct the ordinary evolutions of a steam fleet at sea, and by which ships may take up positions with relation to other ships and objects.

A flotilla of rowing-boats, for war purposes, can be most advantageously managed upon the same general system, as that adapted for steam ships; and most of these observations, and the signals appended to them, are common to both.

The cases in which the evolutions of a steam squadron, would not be suited for boats, or in which those for boats, would not be adapted to steam ships, are obvious and very few; and a distinct code for each is, therefore, unnecessary.

There is such an analogy between the power of changing positions in a squadron sailing free, and in another propelled by steam, that the principles which regulate the evolutions of the one, will govern those of the other; and, so far, these observations are applicable to a squadron under canvas.

But, they do not apply to those movements of a sailing squadron, which are performed "close hauled;" for ships so circumstanced cannot come within the scope of rules, based upon the supposition, that the means exist for moving in all directions.

STEAM TACTICS.

THE " Order of steaming" indicated by signal, will regulate the number of columns in which the ships of a squadron are to be arranged.

There will be one column, or two or three parallel columns, according to the nature of the service to be executed, and the number of ships to be employed upon it. Each column is to consist of as many subdivisions, as shall be considered necessary.

If there be two columns, they will be called Starboard and Port; if three, Starboard, Centre, and Port. If the columns be formed in one line, the Starboard will be the van, and the Port the rear, unless other directions be given.

To every column, a " Leader " will be assigned, and the numerical places, of all other ships in the column will be counted from her, as number one; and the ship at the further extremity of the column, will be designated the " Reverse leader."

The designation of " Reverse leader," instead of Rear or Sternmost ship, has been given to the ship occupying this place, because it can only be when the column is in line astern of the established leader, that the ship at the other extremity of the column can be properly called the Rear or Sternmost ship. She may frequently become for a time the headmost ship, and as such, be improperly referred to or understood as the leader in evolutionary signals; whilst the established leader, being then astern of all other ships, might be supposed to be divested of her character as leader.

The line of direction upon which the ships of a column are to be ranged, taken from the Reverse leader, will be termed the "Formation bearing." The Leader should therefore be upon the Formation bearing from the other ships of her column.*

The opposite of this "Line of direction" will be termed the "Reverse formation bearing."

A column steering a course coinciding, either with the Formation bearing, or, with the Reverse formation bearing, will be in line ahead. Thus, if the Formation bearing and course be West, the ships will appear as in Diagram I; or, if, with the same Formation bearing, the course be East, they will be as shown in Diagram II.

The established Leader will now be the sternmost ship, and the whole column will be reversed. But this circumstance does not change the prescribed Formation bearing, nor the numerical places of the ships; nor cause the "Leader," and "Reverse leader" to exchange their designations.

In like manner, the ships may steer any course between East and West, as in Diagram III; or, as in Diagram IV, and still be upon the Formation bearing as before. In these diagrams, the ships are in "lines abreast."

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* The phrase "Line of bearing" has generally been supposed to have reference to a formation which depends upon the direction of the wind; and in that sense, it is inapplicable to ships moved by steam.

That one phrase should be deemed common to two meanings in speaking of the movements of a fleet, might be very inconvenient, and therefore, in this paper, the phrase "Line of bearing" has been rejected, and "Formation bearing" adopted.

Adjacent ships of the same column are to be one cable's length apart when in close order, and two cables' when in open order. Should a more open or a closer order be required, it will be directed by signal. The distance should depend upon the classes of ships composing the squadron. With gun-boats a much less distance will be sufficient.

The leaders of columns are to be ranged in a line at right-angles to the Formation bearing; and this bearing of leaders from each other, is to be called the "Cross formation bearing."*

The Starboard column is to be on the Starboard beam of the Centre; and the Port, on the Port beam; when the course and Formation bearing are identical, or the columns are in lines ahead with their proper leaders leading them.

If from such a condition the squadron alter course together 16 points, the "Reverse leader" will be the headmost ship, and the established Leader the sternmost; the Starboard column, will be on the Port side of the Centre, and the Port column, on the Starboard side, as shown in Diagram II. Yet, the leaders and the columns are to retain the names by which they were distinguished before the course was altered.

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* With respect to the term "Cross formation bearing," which I propose to use, it is to be observed that the present naval signal book directs that the "order of sailing off the wind shall be formed by parallel columns, each being in line ahead, and that the leaders shall be abeam of each other." It does not recognize the order of sailing, unless each column is in line ahead; nor, with reference to the order of sailing, does it recognize the "line of bearing."

In these respects, I consider our sailing instructions for fleets to be defective, and the defects should not be transferred to the steam tactics which we may adopt.

And, so it is to be with all other mere changes of course.

If the leaders be in the required direction from each other, and the columns individually be correctly formed, every ship will have a proper bearing from the corresponding ships of the other columns; but the position of no ship, except a leader, is to be regulated by that bearing. The stations of the rest of the ships, are to be taken and preserved by reference to their own leaders and to their seconds ahead.

Adjacent columns of large ships are to be a mile apart, unless a different arrangement be made.

A squadron should be considered in " Order of steaming," so long as each column is in exact " Formation bearing," with its ships at the regulated distances; and so long as the Leaders of columns preserve their " Cross formation bearings " and their distances. Simultaneous and similar alterations of course by all the ships, will not disturb these conditions. The arrangement of the squadron will be essentially the same after them as before, and the course it quitted can be instantaneously resumed; therefore, in whatever direction it may so move, the form of combination should be called the " Order of steaming."

If the " Formation bearing " and course be on the same line of direction, and a squadron be in three columns, it will appear as in Diagram I., each column being in line ahead.

When the " Formation bearing " is oblique to the course, each column will be in a " Bow and Quarter line," as in Diagrams V. VI. VII. and VIII.

Should the Formation bearing be at right angles to the course, each column will be in " line abeam," and the corresponding ships of columns should be in line ahead, as in Diagrams III. and IV.

If the Formation bearing and course be opposite the one to the other, each column will be in line ahead; but the squadron will be reversed, as in Diagram II.

Of all formations, the one most easy for ships in a scattered or broken state to assume, is the line or lines ahead; when made, it is the most easily maintained, especially at night, or in thick weather, and it is the best preparative for any further movement. Other lines of bearing are difficult to keep, even during daylight and in moderate weather. They require two adjustments, one of distance and the other of direction, independent of the course; and at the distance adjacent ships should be from each other, it is obvious that a large deviation from a bearing will very speedily be produced by a difference between their rates. Such a disturbance in a few instances would obliterate any trace of a formation; and in a fog, or at night, the order which it would be extremely difficult to maintain would, if lost, be impossible to restore. In ships so broken, the chances of separation and of collision would be greatly increased.

In the line ahead there is no error of bearing to guard against, but that of quitting the wake of the Leader; and slight deviations of distance between adjacent ships, would not so distort the formation, nor incur such risks, as they would when another bearing is required to be kept. Again, dangers are approached with less risk in lines ahead, than in other lines, as the leading ship would warn her followers. It may be added, that the transition from sailing to steaming, or the reverse, will be made with the least confusion and loss of time, when the arrangement of the ships is alike for both.

For these reasons, the order of sailing, or of steaming in line, or lines ahead, may be considered the primary disposition of ships combined for evolutionary purposes; and it is the one in which, when cruizing or making a passage, they should be arranged, except under particular circumstances.

When in line ahead, if the senior officer leading, alter course without making a signal, the other ships of the column are, also to alter course as they successively arrive in his wake; so that the " line ahead " may be preserved.

The course just assumed is to be considered as a new " Formation bearing," to which the leaders of other columns must adjust their " Cross formation bearings " as soon as it can be done. That this proceeding should be adopted is important, for it may often be desirable to alter course when the darkness of night, or thick weather, may render it impossible to make known the required change by signal, which would also render it essential that the squadron should be under conditions the most favourable for keeping their stations.

Yet, when not in line ahead, or when the course and Formation bearing are not identical, if the senior officer were to alter course without a signal, the ships are also to alter course together, and all deviations from the prescribed Formation bearings, which may have been caused by want of a preparatory signal, are to be promptly corrected.

In the former case, to maintain the line ahead was supposed the chief object, as it would be when making a passage, or, under ordinary circumstances; and in the absence of a signal to the contrary, it must be maintained by a successive movement. In the latter case, the line ahead had previously been intentionally relinquished and a particular " Formation bearing " adopted, which, till cancelled by signal, must be preserved by a simultaneous movement.

Should a signal be made to form the " Order of steaming," and be accompanied by one compass signal, it is to be understood that the " Formation bearing " and course are to be identical, as in Diagram I.

If a signal be made to form the order of steaming, and a course and " Formation bearing " be given, the Leaders of other columns are to form upon the senior officer's ship (being a leader) according to the principle already explained. Under such circumstances, to determine readily how the Leaders of the Starboard and Port columns are to assume their " Cross formation bearing," let the columns be supposed in lines ahead upon the indicated " Formation bearing," and the appointed places of these Leaders will be apparent.

Again, if there be any northing in the " Formation bearing," the Starboard column must be Eastward of the Centre; if any southing, to the Westward.

If the Formation bearing were East, the Starboard column must be South of the Centre; if the Formation were West, the Starboard column must be North of the Centre.

The Leaders being placed, the other ships are to be ranged in their prescribed bearing upon them.

Diagrams I. II. III. IV. V. VI. VII. and VIII. represent a fleet in three columns, which may be formed in compliance with the supposed signal; but in each diagram the Formation bearing is West, while the courses, in all the diagrams, are different.

If, when in Order of steaming, the ships alter course together, their compass bearings and distances must be so strictly preserved, that by another simultaneous alteration of course they may resume the one they quitted, without their order having been more disturbed by the changes, than it must inevitably be by the inequality of the time required by the different ships to effect the alterations. Any disturbance arising from this or any other cause, must be instantly redressed by Leaders taking up their exact Cross formation bearing, and by other ships regaining their stations with regard to their seconds ahead.

If there be more than one column, the " Order of steaming " will be a rectangular parallelogram, whatever simultaneous alterations of course may have taken place, as shown by Diagrams I. II. III. IV. V. VI. VII. and VIII.

These simultaneous changes of course will be frequently made by a squadron either upon some emergency, or for some purpose so temporary that the delay of taking up a " Formation bearing " coinciding with the new course, or, in other words, forming lines ahead upon it, cannot be afforded.

When a permanent alteration of course is determined upon, or when it is desirable to have the squadron in line or lines ahead on a particular course, the proposed course and Formation bearing will be indicated in conformity with what has already been said.

Rules for taking up Station on any given bearing, and at any distance, from either a stationary or a moving object.

Rule 1.—" The isosceles triangle method" may be used, when it is desired to take up a fresh bearing, still preserving the same distance from a stationary object.

From 16 points substract the number of points between the two bearings, and half the difference will be the number of points or parts of points between the first bearing and the course the ship is to take.

In Diagram IX. let B bear W.N.W. from A. It is desired to know what course B must steer to run direct to B′, bearing W.S.W. from A, and at the same distance from A that B is.

The ship A being stationary, B A and B′ A must be the sides of an isosceles triangle, of which the track of B to B′ will be the base. The angle at A is 4 points; and therefore each of the other angles is 6. For $\frac{16-4}{2}=6.$

From E.S.E. the back bearing of W.N.W. set off 6 points towards W.S.W. the bearing about to be taken up, which will give South as the course to be steered.

Rule 2.—To find course by Traverse Table.

Whenever one bearing is at right-angles to the other bearing, the course may be at once taken out from the traverse table. Entering under the heads of difference of latitude and departure, with the distance at starting, and the distance to be taken up from the object, and taking the greater or lesser angle, as opposite the greater or lesser side, the angle between the first bearing and the ship's course, is at once obtained. In Diagram IX. let B bear W.N.W. distant 2500 fathoms from A. It is desired to know what course B must steer to run direct to the point C, 1000 fathoms S.S.W. from A.

Entering the traverse table with 250 and 100, we get 2 points as the angle C A B opposite the lesser side A C. Therefore, B must shape her course two points from E.S.E. the back bearing of W.N.W. The course is S.E.

These two rules may often be applied; for though a ship when signalled to take a certain station, may not be at the same distance from the object, that she is to be when in station, yet she may approach it until the distances are equal, and then shape her course by Rule 1; or she may bring the object to bear at right-angles to the bearing to be taken up, and then shape her course by Rule 2.

Rule 3.—To chase under steam, or with a fair wind; or to close an object with a tide running past it.

Set the ship or object by azimuth compass, and keep it on the same bearing.

A calculation to decide on the course is unnecessary. In the ship shaping it, the one to be formed upon must be set by azimuth compass.

Should she "draw forward," the course, according to the existing ratio of the rates, is too much inclined towards her; if aft, the course is not sufficiently inclined in that direction. So by a constant reference to the compass an error in the course may be speedily detected and rectified.

The following observations may show the principle upon which this old and useful rule for " chasing to leeward" is founded.

A ship chased from to windward will, it is presumed, steer upon a straight line, and the shortest distance by which another can overtake her will be a straight line. Except in a " stern chase," these two lines respectively commencing at the places whence the ships start, and meeting where the chase ends, together with the line of bearing between them at starting, form a triangle.

The lines representing the ships' tracks, not only represent the whole distance each has run, but the ratio of their rates. And as the rate of each is uniform throughout, or supposed so, at any given period of the chase, the space run over by the chaser will have the same ratio to that run over by the chased, as the whole distances have to each other. Therefore, at that given period the line of bearing which joins them will be parallel to the first line of bearing; for if in a triangle two sides be divided proportionably, the straight line which joins the points of the section shall be parallel to the remaining side of the triangle.

Now, as during the whole chase the ships should bear from each other in a line parallel to the first line of bearing, the course of the chaser may be thus found, on the assumption that the rates have been justly estimated.

Let them be supposed as 4 : 3.

From any point in the track of the chased draw a line parallel to the first line of bearing. Then with the compasses take such a distance as shall be to that portion of the track of the chased lying between the two parallel lines, as the ratio of the rates, which in this case is 4 : 3. With this distance, taking the starting point of the chaser as a centre, describe an arc, cutting the second line of bearing, and mark the point of section. A line drawn through this point from the starting point will, if produced, be the track of the chaser, and will cut the track of the chased where the ships will meet.

The angle between this line and the line of bearing will show the course of the chaser.

From all this, it follows that to the chaser keeping the chased upon the same bearing will be the criterion of steering a proper course.

Should the chaser bring the chased before the original bearing, she is keeping too much towards the track of the chased; if the chaser bring the chased aft, her course is not sufficiently inclined to that track.

Hence any error in the course will be promptly indicated by the compass; and hence also the old rule for "chasing to leeward,"—keep the chased upon the same point of bearing.

It is obvious, that any alteration in the ratio of the rates, will require a corresponding alteration in the course of the chaser.

EXAMPLE.—DIAGRAM X.

Let A represent the chased.
Let B represent the chaser.
A C the track of the chased.
A B the first line of bearing.

Take A D any portion of A C through D, draw D E parallel to A B.

Then if the rates are as 4 : 3; from the centre B with a distance proportional to A D as 4 : 3, describe an arc, cutting D E in some point F.

Join B F. B F produced will represent the track of the chaser, and will cut A C in some point G, the point at which the ships will meet; and the line of bearing between them at any time, as D F, will be parallel to the first line of bearing.

Rules 1 and 2 provide for cases in which the object to be formed on is stationary, and when the two bearings and the course of the ship form an isosceles or a right-angled triangle. Rule 3 provides for closing a moving object.

We require a method which will give a ready and practical solution for all cases; one that will enable a ship to take up a bearing and distance from a ship in motion as well as from a ship at anchor.

The " Formation Circle" may supply this want.

The Formation Circle.

Circles have been described on boards above the hammock berthing, the taffrail, or other convenient places upon the upper-deck of a ship; and so marked as to determine if she were in her station, and if other ships were in their stations with reference to her.

The marks upon these circles showed the line of the keel, the line of the beam, the windward parallel line, and the direction of the wind when close hauled.

Now, if these circles were divided into 32 points, and from the centre of the circles to their circumferences the line of direction of each point were divided into equal parts, to represent cables' lengths, the circles might be applied to more tactical purposes than they have been.—(See Diagram XI.)

They would give as easily, and more practically than tables can do, the course which a ship should steer to take up her position upon another.

The centre of the circle must indicate the object to be formed on. The position of the forming ship, must be marked on any one of the points, so, that there may be the same number of equal parts between this supposed position and the centre, as there are cables' lengths between the object to be formed on and the forming ship.

This line must have the compass designation given to it, which expresses the bearing of the forming ship from the object.

The position the forming ship is to assume, must be marked in the same way on such other point, as will leave between it and the first, an angle equal to that existing between the two compass bearings.

A ruler or thread held from the station to be quitted, to that to be reached, will give the bearing of the one station from the other.

This last bearing or course must be referred to the centre of the circle, to determine with what point it coincides. It may be so referred by parallel rulers, or by a pair of compasses, or by a thread, thus:—From the centre of the circle measure the shortest distance to the line representing the course, and then, from some other part of that line, with the same measure see what compass direction is a tangent to the circle it would describe. That tangent will be parallel to the course, and therefore will determine its direction.

CASE 1.—*To form on a stationary object.*

Thus, suppose a ship bearing S.E., and distance 9 cables' length from a stationary object, is to take up a W. by S. bearing, and a distance of 7 cables' length from it.

Any compass direction of the circle may be assumed, as the first bearing, and on that direction count 9 equal parts, and mark the spot as at A. As there are 11 points between S.E. and W. by S. take another point that will have an angle of 11 points between it and the first; and upon this second set off 7 equal parts and mark it as at B.

Join A B. Then refer A B to the centre of the circle by parallel ruler; or with a pair of compasses measure the shortest distance from the centre C to the line A B. Then with the same measure, from A as a centre, see what compass direction is a tangent to the circle it would describe.

Gives course W. by N. $\frac{3}{4}$ N.

Now such an application of the Formation Circle to taking up bearings is a mode of obtaining a sought quantity of a triangle, by what is termed construction. A triangle may be instantly produced in which the known quantities shall be represented on a scale in the proportions they bear to each other in the case to be solved, and the sought quantities may be found by a measurement referred to the same scale.

In this Formation Circle the distances either known or sought are measured by the equal parts on the compass lines of direction; and the angles, by a direct reference to the angles at the centre of the circle.

These angles and the sides which include them, of all dimensions, are ready made, and those appropriate for any particular example are palpable at sight; so that nothing remains to be done, but to complete the triangle, and to obtain, at once, by measurement the values of the other side and the other angles.

CASE 2.—*To form on a moving object.*

Let a ship I bearing N. by W. from C be required to take a station immediately astern of C. Let C be steering W. by N. at the rate of 5 knots. Let the rate of I be 9 knots. Then from the fifth division on the W. by N. point, with a distance equal to nine divisions, describe an arc cutting the N. by W. point, the first line of bearing in some point as E, the line of direction from E to D, referred to the centre, will give the course that I must steer to meet C.

Course S. by W. $\frac{3}{4}$ W.

For D E C is a triangle of which the sides D E and D C are respectively equal to the rates of the ship I and C; and the angle D C E is the angle between the first bearing and the course of the chased ship. Therefore D E, as shown in chasing to leeward (Rule 3), will represent the course of the chaser.

A line drawn from I parallel to D E will meet the W. by N. point where the two ships will meet.

CASE 3.

Let a ship, F, ten miles or cables N.E. by N. from C, be ordered to look out, or take station 7 miles or cables N.W. of C; C steering W. by N. at the rate of 5 knots.

F first finds her course by Case 1 of the Formation Circle, supposing C to be stationary, and then, using that course as a first bearing, treats the point G, that she would have arrived at, had C been stationary, as a ship moving at the same rate and in the same direction as C. Let the rate of F be 9 knots.

Thus, by Case 1 of the Formation Circle, the line F G referred to the centre gives E. by N. $\frac{1}{2}$ N. to be treated as a first bearing; then, by Case 2 of the Formation Circle, from the fifth division on the W. by N. point, with a distance equal to nine divisions, describe an arc, cutting the E. by N. $\frac{1}{2}$ N. line in some point as H. H D referred to the centre gives W. $\frac{1}{4}$ S. as a course for F to proceed at once to a point 7 miles or cables N.W. of C; C steering W. by N. at the rate of 5 knots.

To change Formation bearings.

THIS would not be effected with a line, or a single column, in a manner precisely similar to that in which it would be with a squadron in two or three columns.

With regard to a single column or line:—The most usual way would be for the leader to alter course to the new Formation bearing, and the ships of her column to alter course after her as they successively arrived in her wake.

It may be necessary to alter course and Formation bearing without the leader advancing.

As, for example, Diagram XII:—Let a squadron be in one column, steering upon the Formation bearing West. It is desired to alter course and Formation bearing to N.W., the leader A remaining in the same spot.

The leading ship A alters course to N.W. and brings to, B, C and D alter course together by Rule 1, six points to S.S.W., and as they successively arrive in the wake of A′, they form in line ahead and regulate their speed by hers.

A shorter mode. The ship C, Diagram XIII, becomes the pivot, and brings to on the new Formation bearing N.W. By Rule 1, A and B alter course to N.N.E. and D and E to S.S.W. and form ahead and astern of C.

Or, without advancing much, A or C alter course to N.W. and reduce their rates. The other ships find a first course by Rule 1, or Case 1, of Formation Circle, and then, treating that as a first bearing, find course by Case 2, and take up new Formation bearing on A or C.

With respect to changing the "Formation bearings" of a squadron in more than one column, it will be observed, that if the columns first formed as independent single lines, their distances apart would be affected.—(See Diagram XIV.) For, as the columns are on parallel lines of which B B′ B″ represent the pivots, the perpendicular distances between them, will vary as they revolve; and when they have passed through a certain number of points, they will coincide in the line which passes through the pivots.

Such a consequence, in many cases, would render it impossible to re-form the columns independently; and shows that, as a rule, it will be more convenient, that the leaders should first form with regard to each other, or at least with regard to the other columns.

By what rule, then, are the leaders to take up their proper positions? Any rule that gave a rigidly correct course, by which ships may "form upon" another ship, must be founded upon the supposition that both parties, during the evolutions, will have unvarying and precisely ascertained rates; and that the rate of the ship "formed upon," will be communicated to those making the movement. As even she will usually have to change her course, this communication cannot be made, till the new course has been assumed sufficiently long, to show how the speed has been affected by the altered action of the wind and sea upon the hull and spars. Some five or six minutes will elapse, whilst the headway is becoming uniform, and before the speed can be announced, for a knowledge of which the others are to wait.

When the signal has been distinguished, the course for the forming ships must be calculated, or taken from tables.

Before all this is accomplished a forming column might have been in its station.

But after the course is thus settled, it is not very probable that it will be the correct one. All the data upon which it has been determined, are too subject to error and to variation to be the basis of a nice calculation. But, above all, how is such a plan to be conducted at night?

Tables have been constructed with the object of giving courses by which ships, under the supposed conditions, may form unerringly upon others. The principle they are founded upon, is no doubt correct; but, practically, the tables are inapplicable to this purpose.

The leaders of the forming columns, should be guided by Rule 1, and run down the base of an isosceles triangle, until they bring the pivot point on the new Cross formation bearing, then alter course to the new Formation bearing, and steam abreast of the leader to be formed on.

The pivot point would be marked, by the ships of the column to be formed on, successively turning at it.

This would insure the columns not closing on each other, as they would if the leaders of the forming columns steered direct to their places.

It would give a certain rule for all cases. Forming leaders would alter course half the number of points the Formation bearing was changed—and the rule is as applicable to night as to day.

The leaders of the forming columns would, if necessary, correct their distances from the column to be formed on, as they steam up abreast of its leader.

If the change of Formation bearing, was more than 12 points, it would require two movements, as in Diagram XVIII. First, if the change was to be 12 points, and then as many as will complete the number.

If a change of more than 12 points is made in one movement, the columns will close too near each other.

It is to be remembered that the choice is not between a rough rule and a precise one; but between the former and none, for that is no available rule which requires data unobtainable in practice.

When in Order of steaming with the columns in lines ahead—*i. e.* with the Formation bearing and course the same—and it is intended to change both, but to preserve the lines ahead, the movement will be made by one of the modes represented in Diagrams XV. XVI. XVII. XVIII. XIX. and XX.

In Diagram XV. the squadron is in three columns. The Formation bearing and course are the same, viz. South.

It is required to alter course and Formation bearing 4 points to starboard, or to S.W.

The leader of the Starboard column is to be steered upon the new Formation bearing S.W., with merely sufficient head way to keep her under command, until the leaders of the Centre and Port columns, are on the new Cross formation bearing. They alter course to S.S.W. by Rule 1, and push on, until the pivot point, marked by the ships of the Starboard column turning at it, bears N.W., when they steer S.W., parallel to the Starboard column, and steam into station abreast of its leader.

The ships of each column regulate their speed by that of their respective leaders, and form astern of them as they arrive in their wakes.

During this, and all other evolutions the columns are to be kept distinct, and the ships of one are not to intercept, nor to mix with those of another.

Any other alteration of course and Formation bearing towards the right may be effected in the way described, as in Diagrams XVI. XVII. and XVIII.

The squadron being under the same circumstances as before, it is required to alter course to port.

The leader of the Port column, now becomes the pivot ship. The principle of the movement is, of course, the same as before.

When the Formation bearing is to be altered 12 or more points, the movement may be made upon less ground and in less time by the mode shown in Diagram XX.

Suppose the alteration of Formation bearing to be 16 points.

Let the Centre alter course in succession 16 points; let the Starboard column pass ahead of the Centre round to its station on the other side; and let the Port column pass also ahead of the Centre, but *outside* the Starboard. Should the alteration of Formation bearing be less than 16 points, but more than 12, a second movement will be necessary. The first movement will be made as if the required alteration were exactly 16 points, and when that is completed, the second is to correct the excess that has been produced by the first. The second will be made to the right or to the left, as circumstances may require, and as pointed out in Diagram XV.

If it be desired that the prescribed order should be preserved, by keeping the Starboard and Port columns on their established sides of the Centre, the plan of wheeling upon a leader, as in Diagrams XV. XVI. XVII. and XVIII. or that of transforming the columns, as in Diagram XX, must be followed. For if the ships of each column were to turn in succession, as in Diagram XIX, the Starboard column would be on the port side of the Centre, and the Port on the starboard side.

It may be asked, why is it necessary to preserve the same columns as right and left of the Centre, and why not let it be a matter of indifference which is on the right or on the left; so that considerable alteration of Formation bearings might take place without entailing so long an evolution as is necessary to preserve a right column as a right, and a left as a left?

It is, however, necessary that after or during a fog, or in partial and occasional clearance of weather, officers may have some guide, as to where they are to take their ships without having to wait for a signal to direct them. The senior officer's ship is the basis of the formation, and it is essential, in order to reduce the risk of collision and disorder, that whoever sees her may know at once on which side of her he is to place himself. Thick weather, accidents, gales, detached duties, constantly lead to the separation of ships from the body of the squadron, and on rejoining, possibly at night, as soon as the course of the flag ship is made out, the position of the column of the rejoining ship is known; and, knowing his column, and, of course, knowing his number in it, he proceeds at once towards his station, where he finds his established second astern prepared to make the requisite space for his admission.

Circumstances may occasionally render it desirable to alter the Formation bearing 16 points in a small space, and in a short time; and when such circumstances do occur, they may be provided for in two ways. First, the ships of each column may alter course in succession 16 points, as in Diagram XIX, and the established Starboard column may be directed by the same signal to act as the Port, and the Port as the Starboard, till the signal is annulled.

Or, secondly, the squadron may alter course together the required number of points, and by the same signal the reverse leaders may be instructed to act as leaders; and leaders, as reverse leaders; and the established Starboard column to act as Port; and the Port, as Starboard, as in Diagram II. This assignment of duties and designations must also remain in force till it is annulled.

This might be called the "Prescribed order reversed."—(Diagram II.)

It may be often necessary to take up a new Formation bearing different from the course to be steered, and it may be effected by either of the following modes: By changing the Formation bearing to the one required, and when the squadron is formed on the new Formation bearing, the whole alter course together to that which they are to steer.

Or the leader of the column to be formed on, is to reduce his speed, keeping the course to be steered; the other leaders take up their Cross formation bearing from her, and the ships of all three columns bring their respective leaders on the new Formation bearing.

To form the Order of steaming from line ahead.

No rules for this are admissible which require calculations depending upon the speed of columns to be signalized, or which cannot be acted upon at night.

In this evolution one column should remain as nearly stationary as possible, that the others may form by it.

Unless otherwise directed, the Formation bearing is to remain as before.

Let the squadron consist of two columns, and the movement be made by the Port or the Rear.

The following simple considerations will determine, with sufficient accuracy, the course which the moving column should steer to take its station. Assuming that the Starboard or van column remains stationary, the course of the Rear will, as shown in Diagram XXI., depend on A B, the length of the Van column, and on A C, the established distance between the columns when in Order of steaming. A line from B to C will represent the direction and the distance of the station of the leader of the Port column, from her station in line ahead.

On the preliminary assumption, that the Starboard column will not move, and that the compass direction B A is known, all that is wanted to determine the course, is the angle at B.

By the regulation for the Order of steaming, the angle at A must be a right angle, and the sides B A and A C are given, since the latter is a fixed distance, and the former may, if necessary, be taken by a quadrant.

The angle A B C may be found from the Traverse Table, Rule 2.

A small abstract from the Traverse Table, as the following, should be inserted in the signal book:

Distance A C between the columns in yards or fathoms.	Length of column A B in yards or fathoms.										
	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800
	Angle A B C in points.										
2000	6	5¼	4½	4	3½	3¼	2¾	2½	2¼	2⅛	2.
4000	7	6½	6	5¾	5¼	4¾	4½	4¼	4	3¾	3½

But as the Starboard column will not be quite stationary, the course of the Port column will depend upon their comparative velocities. It must make a less angle with A B than B C makes, and therefore an error will be confined to inconsiderable limits, and at least the direction of the error will be known.

Were it possible to restrain the column or ship to be formed upon, to a precise rate, the angle at B might be decided exactly; because the ratio of the rates of that which is formed upon, and that which is making the movement, would be known. But this rate cannot be fixed, for it cannot be certainly controlled If, for instance, 2 knots were given as a rate, a moderate breeze abaft the yards, even without sails, would make it impossible to restrain large ships to that rate. This consideration alone shows, that it would be delusive to deal with the rate, as a quantity that can be determined with accuracy.

But the rate may be nearly known, if the ships to be formed on, reduce their speed as nearly as possible to a fixed one for all cases. Then from the direction of the wind and sea, it might be easily judged whether this speed had been accelerated or diminished. By Case 2 of the Formation Circle, taking C B as a first bearing, and the point C as a chase moving at the rate and in the direction of the point A to be formed on, the angle C B C′ would be known.

The first line of bearing C B should always be ascertained, and noted by every ship "ready" for manœuvring.

Again, let the movement be made by the Van or Starboard column.

The Rear or Port column now remains as nearly stationary as possible. The course of the Van or Starboard column depends upon A B, the length of the Van column, and on B C, the distance between the leaders when in station.—(Diagram XXII.) The angle B A C may be taken from the traverse table by inspection.

The observations upon the last case apply also to this, except that the angle C A C′ must be added to, instead of substracted from, the angle B A C.

With respect to the different modes of forming line ahead, from Order of steaming, and of forming Order of steaming from a line ahead, by substituting one column for another, it may be proper here to remark, that there are more, than will be given in these observations.

By making the Port the Starboard, or the Starboard the Centre, and by other transpositions of columns, manœuvres may be devised; but which could answer no useful purpose, and it would therefore encumber a signal book, to provide for them.

Should, however, such transpositions be necessary, the senior officer would have the power of making them, by using the divisional flag, as directed in page 14 of the signal book.

From the Order of steaming to form a line ahead.

THE same rules apply to this, as in forming Order of steaming from line ahead, when the course of the forming column is regulated by its leader.

But it may be regulated by the sternmost ship, when the movement is made by a column, that is to be ahead of another. As the sternmost ship of the moving column, will be immediately ahead of the leader of the column to be formed upon, she might shape her course, and be guided in doing so, by an application of Rule 3. Whatever course will conduct her to her station, should be the course for the other ships of her column; as throughout the manœuvre they have to preserve their relative bearings and distances.

An instruction might be appended to the signal for the evolution, " that the course will be determined by the sternmost ship."

No signal to specify the course will be wanted from her, as the other ships can steer parallel to her; but great attention must be paid, that they vary their course as she varies hers.

In this mode, the error of the course will be corrected by reference to the compass; so in the other, the error of the leader's course will be as readily detected and corrected by a reference to the Formation Circle.

If the bearing of the two leaders be either unchanged, or be unduly changed, the Formation Circle will show, that the course steered will bring the leader of the forming column within less than the proper distance from the other leader, or else beyond it. The amount and the direction of the error in a certain time, will show the correction that is required.

The same rules will apply to forming line abreast. The leaders of columns will open out, according to the number of ships to form between them.

The signal may be made either to form line abreast in single line, or in divisions of two, three, or any number that may best suit the occasion.

In all evolutions requiring simultaneous alterations of course, the utmost care must be taken to preserve the relative bearings and distances of ships. Should the unequal time taken by different ships to alter course, disarrange the relative bearings and distances, the order must be readjusted as promptly as possible.

To anchor ships on given Bearings, and at given distances from each other.

THE disuse of buoys has increased the difficulty of anchoring a ship on a given bearing from another already at anchor. Formerly, the anchor would have been placed on the required bearing from the buoy of the ship at anchor; and then, when both ships rode by an equal scope of cable, and were under the influence of the same wind and tide, the proposed line of direction between them was adjusted.

But as a ship may be wide on either side of her anchor, it is evident that, if instead of her buoy, she were herself made the criterion by which the anchor of another were to be dropped, when both rode by a tight cable, they might not have the required relative positions.

If the ships were to be a considerable distance apart, such nicety as that of placing the anchors on the given line of direction, would not probably be required, and the object would be practically gained, if the ship to anchor, brought the hull of the other into the bearing at the time of letting go her anchor.

But for closer work, as we have not in these days buoys to guide us, the matter is less simple. The ship by which others are to form, if not moored, may have her anchor anywhere, within the range of a cable's length from her bow, whilst she may be riding by the bight of a slack chain. Another may be brought up with the utmost precision in a given direction from her; and yet when the cables of both are tight the bearings may be palpably disarranged. It is pure guess work, if the position of the anchor of the ship to be formed upon be unknown.

That position cannot be determined, unless the conditions of the wind and tide, make it evident that the ship and her anchor, must have certain reciprocal bearings; or unless the ship have so short a scope of cable, that she will show the position of her own anchor.

Generally, the ship by which a squadron are to form at anchor upon a given bearing must be moored, or be riding by a very short scope; and if the squadron are to remain at single anchor, it will be convenient that each of them should remain, close to her anchor, till all are placed.

Assuming, that these arrangements are made, the station of ships, both as to bearing and distance, may be accurately taken up by either of the following rules.

First:—The easiest mode, if local circumstances will admit, is to place the ship about to anchor, in the required bearing, at some little distance from the spot at which she is to anchor, and then steer her along the bearing, or along the back bearing as the case may need, till that spot is reached. Care must be taken not to arrive there with too much way, or in such a state that it will be inexpedient, to drop the anchor without a moment's delay. It must be remembered, that a few fathoms subtend considerable angles, at a point that is near; and therefore any want of promptness in this matter might cause a serious error.

A weather-tide, or slack water; is the most favourable opportunity, for a ship under sail to take up a berth at an anchor; but for a ship under steam, it will usually be most convenient to anchor when stemming both wind and tide.

Although to steer along the given bearing to gain a position may frequently be possible, yet often it will not be so, and then the position has to be taken up, whilst steering a course oblique to the bearing.

The place to be steered for is not seen; and still if the bearing be not struck upon at the assigned distance from the stationary object, and the anchor let go at the very point of intersection, the ship will not be in station. She should meet the bearing at this precise distance.

Thus let the signal be made for the ship at B, (Diagram XXIII.) being then 9 cables S.E. from A, to anchor 5 cables N.N.E. from A. Case 1 of the Formation Circle gives the angle A B C as $2\frac{1}{4}$ points, the $2\frac{1}{4}$ points set off from N.W., the back bearing of S.E. would give N. by W. $\frac{3}{4}$ W. for the course that would take the ship from B to C.

Or, secondly:—The Traverse Table can be made available. For, although that table is directly applicable to right-angled triangles only, and the two bearings and the track from one point to the other, as they exist at first, may not be a right-angled triangle, yet, by altering the ship's position, she may be easily brought upon a bearing which shall be at right angles with the bearing she is to have at anchor, and when that is done the Traverse Table will solve the question of the course.

Thus, in Diagram XXIV., let a ship at B, 9 cables S.E. from A be required to anchor N.N.E. from A, at a distance of 5 cables.

As E.S.E. is at right angles to N.N.E. B may steer Northward till she is E.S.E. from A. When there, as at B′, her distance from A must be taken. Let it be 4 cables. Then, entering the Traverse Table with 4 and 5, as diff. of Lat. and departure, we obtain $4\frac{1}{2}$ points, which set off from W.N.W. the back bearing of E.S.E. we get N. by W.$\frac{1}{2}$W. as course from B′ B″.

Or, thirdly:—Instead of the moving ship first getting on a bearing from the stationary ship, which shall be at right angles to the bearing she is to anchor upon; let her, upon any bearing, get temporarily at such a distance from the stationary ship as shall be equal to the distance at which she is to anchor from her. Then the two bearings, joined by a line from the places denoting the distances, will form an isosceles triangle. Thus, in Diagram XXV., let the ship at B, 9 cables S.E. from A, be required to anchor N.N.E., 5 cables from A.

From B she steers to the Northward till she arrives at a distance of 5 cables from A, as at B′, when the bearing B′ A is taken by compass, B′ A B″ is an isosceles triangle. Apply Rule 1.

Or, fourthly:—The course for anchoring ship may always be obtained from the Formation Circle. If a tide is running past the ship to be anchored on, use Case 3 of the Formation Circle, treating the ship A as a point moving in the direction and at the rate of the tide.

To moor upon a given Bearing, and at a given distance from a Ship already moored.

THE simplest conditions under which the mooring of a ship upon a given bearing, and at a given distance from another ship, can be conducted, are when it is a matter of no consequence in what direction her hawse is open, and when the weather is so moderate, that a running moor may be made. She may then be brought upon the bearing, and taking care not to diverge from it, either be steered from or else towards the ship or object by which she is to form, placing both her anchors upon the bearing, so that when she is between them, she may be in the required position.

But in most anchorages it is necessary to have an open hawse in a particular direction; which adds another condition, to that of going direct to a given distance, on a given line from another.

The ship being A, (Diagram XXVI.), being already moored with an open hawse to the West, the ship B is to be so moored as to bear S.E. from A at a distance of $1\frac{1}{2}$ cables, and also to have an open hawse to the West.

Let B find the bearings and distances her anchors will have from A at C and D, when she is moored in the required position at B′.

In the triangles A B′ C, A B′ D the sides A B′, B′ C or B′ D are known, and the included angle A B′ C or A B′ D. Case 1 of the Formation Circle will give the bearing and distance of C or D from A.

Then wherever B may be situated, she must be steered for C or D as may be most convenient; and her course to either of those points, may be found by any one of the rules given for anchoring on any given bearing and distance from another ship.

How B will proceed to moor after her first anchor is placed, must depend upon circumstances. If there be a lee tide, the ship should be swung to her first anchor, and backed astern; if a weather tide and a commanding breeze, or steam be used, she should be shot ahead of her first anchor to the place of her second.

Or she may wait till the lee-tide makes, and then the cable of her first anchor be backed out.

But the matter immediately under consideration is rather that of assuming given bearings and distances.

NOTES.

1st. The senior officer of a squadron, must be careful, whilst the fleet is performing evolutions, that the rate of speed adopted is such, that the slowest vessel, without pushing her boilers, is able to keep her station.

2nd. That if a celerity in manœuvring is required, not easily obtained from any particular ship of the fleet, on account of her slowness, it is better that such a ship should be directed to quit the line, and take up a position, in which she could act independently.

3rd. The speed adopted at all times ought, however, to be sufficient to enable those ships, whose screws are of a coarser pitch than the rest of the fleet, to make that number of revolutions, which is required, for the smooth working of their engines.

4th. In all signals that refer to the points of the compass, unless otherwise expressed, the true compass bearing is intended, that is to say, the compass bearing corrected for local deviation.

ROWING-BOAT EVOLUTIONS.

THAT rowing-boats may be properly managed, when they are combined to attack ships, boats, or batteries, to support mortar or other vessels, or to embark or to disembark troops, it is necessary they should be moved, according to a regular and prescribed system.

The principles laid down for the management of steam ships, are suited also for boats moved by oars, although all the rules and all the evolutions that are applicable for the one class, may not be so for the other.

But the exceptions are so few, that the code of signals which contains what is actually essential for both, should embody the especial and exclusive wants of each.

When the signification of a signal, as noted in the signal book refers to steaming, and the signal is addressed to a rowing boat, it means that she is to perform the evolution under oars, as a ship would under steam in compliance with the same signal. The mere setting of a sail, even in obedience to a signal, by ships or boats, is not to cancel the order of rowing or of steaming. That order they must preserve unless it be annulled by signal; but if annulled, they must be guided by the tactics of sailing ships.

The order of rowing may be made known by signal to the ships which are to furnish the boats; or by verbal or written communications to the officers, in charge of the boats when they assemble.

If the order of rowing be not made known by signal, so that it may be noted in writing by every officer concerned, it will be convenient to give the officer of each boat a paper, having a diagram representing the relative positions of the boats when formed.

Thus:—

Starboard division.	Leander's Pinnace.	Leander's 1st. Cutter.	Leander's Barge.	Leander's Launch.
Centre.	Thetis's Launch.	Thetis's Barge.	Fox's Pinnace.	Fox's Launch.
Port division.	Arethusa's Launch.	Arethusa's Barge.	Phaeton's Pinnace.	Phaeton's Launch.

The first-named vessel in each column, is to lead.

The distinguishing pendant or pendants of each boat, should correspond with her numerical place from her leader; and it is to be shown, when necessary, under the flag of the division or column to which she belongs.

The composition of each column may vary with the nature of projected services. On some occasions the heavy boats will be required in the van; on others, the light; or different classes may be wanted in the same column.

When boats assemble for exercise, or for service, they are, if a "Formation bearing" be not indicated by a signal, to fall in astern of their leaders in their proper succession, and to consider the direction of the leader's head as the "Formation bearing" for the time.

The columns are to be 100 feet apart, unless otherwise directed.

The adjacent boats are to be 40 feet apart. In every boat, there should be two persons to attend to signals and orders.

The leaders and reverse leaders, are to wear their ensigns. Those of the starboard column, are to wear them in the bow; those of the centre, amidships; and those of the port, in the stern.

The other boats are not to wear ensigns; but are to keep their ensign-staffs up, and placed similarly to the staffs of their respective leaders.

The staff will serve for hoisting the answering pendant upon, whilst its position will show the column to which the boat belongs.

When the boats from various ships promiscuously approach the place of assembly, or when during any service or exercise their formations become seriously disordered, if leaders hoist their ensigns, and other boats their numbers, that, together with the position of their staffs, will give the ready means of forming or re-forming.

Any change in a boat's position will require a corresponding change of her number, or of the position of her ensign-staff, or of both.

The senior officer will lead the starboard column, unless another arrangement be made.

The other leaders must dress or form most carefully by the leader of the starboard, and after every evolution they must take up the exact bearings and distance as rapidly as possible, since the other boats have to form by them.

The Arrangement for landing a Force will be called the "Disembarking order."

The "Disembarking order" of the boats is formed with reference to the men to be landed from them. It should be so formed that men who are to be next to each other in the ranks on shore, should be, if not in the same boat, in boats that will be adjacent to each other when beached.

The leading boat of the starboard column, will embark the extreme right of the troops; and the other boats of that column, according to their numerical places, will embark troops in their appointed succession from right to left.

The leading boat of the centre, will receive the troops who are to be next to those in the sternmost boat of the starboard column; and the rest of the centre, in their order, are to be filled with troops as they are to follow in the ranks.

The port column continue the process that has been begun by the other two. The troops will then be so disposed of in the boats that they may be landed in their regular order, either at the same moment or in succession, from divisions of boats or from single boats.

The number of soldiers for each boat, ought to be previously arranged, and a return be made of how many men are to be furnished by every transport. The boats may then be told off, from the leader of the starboard column to the sternmost of the port; so that, the transfer of troops from ships to boats, may be simultaneously and systematically effected.

There are many points to be considered in determining upon a " Disembarking order." If it can be avoided it must not be with each column in line ahead; for then the operation of landing, would be protracted as well as rendered very difficult if opposed by an enemy.

Nor in one line ahead, for that would have the faults of the last case in a greater degree. Nor must it be in one line abeam. For, as in close order the boats are to be 40 feet apart, the front occupied by the boats on the beach, would be greater than that requisite for the men when on shore; and the more extensive the front, the less effectually will the advance and landing be protected by gun-boats on the flanks, and fewer places will be available for the purpose.

Nor must it be with each column in line abeam; although this would have the advantage of landing the force compactly, if the port and centre columns were beached between the boats of the starboard. For, to obtain this advantage, in conjunction with that of landing the men in their appointed order, there would be the great preliminary disadvantage, of requiring, alongside the same transport, boats from all 3 columns, which, being thus separated and intermixed, would not be properly controlled. Such an arrangement, would also entail the inconvenience, of rendering it impossible to detach a column without breaking up the organization of the troops it contained, as well as that of those remaining in the columns from which it had been separated.

Yet the boats, when beached, must be so concentrated, that the men when landed may not be unnecessarily spread, that the beach in front of their approach, may be well under the fire of the flanking gun-boats; and because a smaller extent of good beach is oftener found, than a large one.

First:—The "Disembarking order" must then have a small front.

Secondly:—It must be so compact from front to rear, that the time between the beaching of the first rank of boats, and that of the last shall be as short as possible.

Thirdly:—The boats of each column, when beached, should be ranged in the same succession, as they are when formed afloat.

Fourthly:—It must admit of a column, or a part of a column, being detached without taking away unsorted fragments of the landing force.

Fifthly:—It must admit of the columns being sent to different points, each column being complete in itself.

Sixthly:—Should the beach be found unsuited for landing the whole together, the "Disembarking order" must be such as to admit of landing the men, without delay or confusion, in the continuous succession in which they are to form.

Finally:—It must be easily and rapidly assumed from the ordinary Order of rowing.

If the distance from the ships to the place of landing be not trifling, the boats will be in Order of rowing when proceeding from one to the other; but before they get under fire, the Disembarking order should be formed perpendicularly to the beach.

The transition from Order of rowing to "Disembarking order," will be effected by each column being broken up into sections of every three consecutive boats. The first section, viz. 1, 2, and 3, preserve their relative positions; the second section, 4, 5, and 6, pull up on the port beam of the first, at a distance of 40 feet; and the third section, viz. 7, 8, and 9, take their stations 40 feet on the port beam of the second.

Each column taken singly may be considered to be in the usual Order of rowing, in 3 columns, with an interval of only 40 feet between the columns.

The signal for this formation will be "Form disembarking order by threes ahead." The order when formed will appear as in the diagram.

Port Column.	Centre Column.	Starboard Column.
7 4 1	7 4 1	7 4 1
8 5 2	8 5 2	8 5 2
9 6 3	9 6 3	9 6 3

With this formation strictly preserved, the boats should approach the shore to within 100 feet, when the signal should be made or the order given "to land."

Numbers 1, 4, and 7, of each column, taking the greatest care not to close each other, will touch the beach about the same moment. No. 2 is to be beached about 6 feet on the left of No. 1; and No. 3, about 6 feet on the left of No. 2. So that when the breadth of each boat is allowed for, the distance between Nos. 1 and 4 will be pretty equally divided by 2 and 3. This applies to all the columns.

On the beach they appear as in the diagram:

Port Column.	Centre Column.	Starboard Column.
987654321	987654321	987654321

The arrangement of the flanking gun-boats, must depend upon local and varying circumstances.

Should it be desired to disembark upon the bank of a tortuous or narrow river, or in any place to which the boats must proceed in a single line, the "Disembarking order" may be formed from the single line, without making the "Order of rowing" an intervening step in the operation.

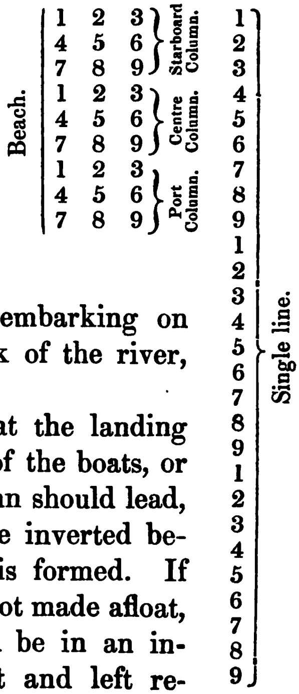
The sternmost boat of the leading column being opposite to the middle of the beach, the signal, "From line ahead form disembarking order by threes abeam to the left:"

No. 1 of the leading column would have her head placed towards the part of the beach upon which she is to be laid, on her own left; but on the right shore of the river.

No. 2 would form 40 feet astern of No. 1, and No. 3 would form 40 feet astern of No. 2. No. 4 closes up to 40 feet from No. 1, and forms on her beam; Nos. 5 and 6 form astern of No. 4. No. 7 forms on the beam of No. 4, and Nos. 8 and 9 astern of No. 7.

No. 1 of the centre closes up to 40 feet from No. 7 of the starboard column, and her column form "by threes ahead" upon her, as the starboard column did upon their leader.

No. 1 of the port column closes up upon the centre, as the centre did upon the starboard, and her column form "by threes ahead" upon her.



When formed in Disembarking order they will appear as in the diagram, having less than $\frac{1}{3}$ of the front they had before the change of order.

It will be observed that the boats are now formed for disembarking on their left, or on the right bank of the river, looking towards its mouth.

Should it be anticipated that the landing must take place on the right of the boats, or on the left bank, the port column should lead, or the line of boats should be inverted before the Disembarking order is formed. If this disposition of the boats be not made afloat, the troops when landed would be in an inverted order; with their right and left respectively upon the ground that should be occupied by the other, and the counter movement, if indispensable, must be made on shore.

It is obvious that it would be desirable to have the men placed on shore, in their proper relative positions. But it must be a matter that can only be determined under some definite conditions, whether the time lost in inverting the order, either in the boats or after landing, would be more detrimental, than the somewhat irregular placing of the companies.

With tolerably disciplined troops, the inversion of the companies, taken singly, might be easily rectified; and even if it could not, might not an attack be effectually made provided the men of each company were kept together?

It would be a question for the military officer to decide, and if he deemed it better to land at once, rather than make a counter movement with the boats, the "Disembarking order" would be formed by going "threes abeam to the right."

The mode of operation would be the same in principle whether to the right or to the left, and need not be again explained.

There should be the power of moving in any direction, without disarranging the "Disembarking order." As the boats must be steering upon a course at right angles to the beach immediately before they are run upon it, they should previously be so placed, that the centre of their formation, may be opposite to the centre of the situation, selected for the disembarkation.

On approaching the shore it may be evident that a better spot should be chosen, which must be gained without delay and without confusion.

Or, it may be desirable to make a feint on one part, and the real attack on another.

These and other very likely contingencies, make it important that when in " Disembarking order " there should be no difficulty in making simultaneous alterations of course, and afterwards in preserving " Relative bearings " and distances.

The operation will be precisely of the same character, as that of altering course together when in Order of steaming. Nos. 1, 4, and 7, or all leaders of sections of threes, must represent leaders of columns, and their respective sections must form and dress by them.

The leaders of sections must, however, be only 40 feet apart; they must form and dress by the senior officer or leader of the right section, unless the signal should be made for the " Reverse leader " to lead, and then the leader of the left section is to be the one from which other leaders are to take their " Cross formation bearings."

Besides the power of altering course together, and of moving from one place to another with unchanged " Formation bearings," a power should also exist of changing the " Formation bearings " of the " Disembarking order."

This also will be performed, on the same principles as regulate such a movement when in Order of rowing.

The landing of troops may be necessary in a river so narrow, that the boats cannot be formed in sections of threes.

It may still be possible to form them in sections of twos. But as in every 40 feet there will be one boat less, than would have been had the boats been beached from sections of threes, the men landed will probably have to close upon the centre, if under the expectation of an immediate attack.

Although the front of the disembarkation will be greater by $\frac{1}{3}$ than in the latter case, yet it will be but $\frac{1}{2}$ of what it would be were boats beached from a single column, to which it is therefore greatly to be preferred.

Should it be necessary to disembark from a single line, the signal would be made "From line ahead" form "Disembarking order" in one line "abeam."

SIGNALS FOR BOATS.

Order of Rowing.

FROM Order of rowing in 2 or 3 columns form "Disembarking order" by threes ahead.

Land:—

From "Disembarking order" form Prescribed order of rowing:

From one line ahead form "Disembarking order" by threes abeam to the left.

From one line ahead form "Disembarking order" by threes abeam to the right.

"Disembarking order" alter course together number of points indicated.

"Disembarking order" change the "Formation bearings" number of points indicated to the right.

"Disembarking order" change the "Formation bearings" number of points indicated to the left.

Form line and steer after leader, or boat indicated.*

Form open order.	The boats of each column are to be 80 feet apart.
Form close order.	The boats of each column are to be 40 feet apart.

Boats of each column are to be the number of feet indicated apart.

---

* Such a signal may be necessary when a course cannot be given, as when going up a tortuous river.

Columns to take open order. { The columns are to be 200 feet apart.

Columns to take close order. { The columns are to be 100 feet apart.

Columns are to be the number of feet indicated apart.

From Order of rowing in 2 or 3 columns form "Disembarking order" by twos ahead.

From one line ahead form "Disembarking order" in twos abeam to the left.

From one line ahead form "Disembarking order" in twos abeam to the right.

From one line ahead form "Disembarking order" in one line abeam.

Leaders of columns are not preserving their "Cross formation bearings" with accuracy.

Leaders of columns are to keep all the boats of their respective columns in their stations.

Boats with reserve ammunition, and shot, show their numbers.

Boats with reserve ammunition are to carry a red flag.

Boats with reserve ammunition to communicate with the right of the force landed.

Ditto, with the centre of the force landed.

Ditto, with the left of the force landed.

Ditto, with the senior officer of the boats.

All boats are to be kept afloat, close to the beach, and in their stations ready to receive troops. But more especially when troops have landed in launches and heavy boats.

Covering launches and covering boats are to form in a line abeam on flanks, and cover embarkation or disembarkation; and remain in position till the troops are clear of the beach.

When troops have landed, boats' crews and officers are to remain in the boats, unless landed by order of the senior officer.

Boats as they quit the beach are to back astern till they are 200 feet from the beach, or quite clear of other boats.

Boats (or boat indicated) with provisions are to hoist their distinguishing flags, and communicate with the right of the force landed.

Ditto, with the centre.

Ditto, with the left.

Boats with stores, tents, or equipage, (or boat indicated,) are to hoist their distinguishing flags, and communicate with the right of the force landed.

Ditto, with the centre.

Ditto, with the left.

SIGNALS.

The following Signals are intended as Illustrations of the Rules which have been explained, rather than as a complete Code.

THE adoption of a few Signals for taking up Formation bearings, and Cross formation bearings, together with the introduction of the terms Leaders and Reverse leaders into the signal book, would give the power of directing all necessary manœuvres by it.

As noticed in page 30, when a squadron is formed in a single line, the Starboard column will form the Van; the Centre column, the Centre; and the Port column, the Rear. If other transpositions of columns be necessary, the senior officer has the power of making them, by using the divisional flags, as directed in the signal book.

By Signals 1 to 11, a squadron can be brought into order from a scattered state. A squadron already formed can, by the same signal, be made to assume any of the formations proposed in the Tactics, in either one, two, or three columns, on any Formation bearing, at the same time steering a given course.

Signal 1. On the Starboard column, form Order of steaming in one column.

Signal 2. On the Centre, ditto.

Signal 3. On the Port, ditto.

Signal 4. On the Starboard, form Order of steaming in two columns.

Signal 5. On the Port, ditto.

Signal 6. On the Starboard, form Order of steaming in three columns.

Signal 7. On the Centre, ditto.

Signal 8. On the Port, ditto.

Signal 9. On the Starboard, form Order of steaming in columns of subdivisions.

Signal 10. On the Centre, ditto.

Signal 11. On the Port, ditto.

Note to Signals 1 *to* 11.—If one Compass signal be shown with either of the signals, it will denote the course and Formation bearing, which are to be identical; as in Diagram I.

If two Compass signals be shown, the upper or first signal, will denote the Formation bearing; the lower or second signal, will denote the course, which will be different from the Formation bearing, as represented in Diagrams II. IV. V. VI. VII. and VIII.

If no Compass signal be shown, supposing the squadron to be already formed, the course and Formation bearing are to remain the same, as they were before the signal.

With regard to Signals 9, 10, and 11, the Leaders of subdivisions will act as Leaders of columns, and take up their Cross formation bearing from the Leader of their column. The other ships of subdivisions, are to form by their respective Leaders.

Signal 12. Change Formation bearing and course.

Note.—One Compass signal will denote the New formation bearing and course, which are to be identical.

Signal 13. Change Formation bearing and retain the same course.

Note.—One Compass signal will denote the New formation bearing.

Signal 14. Change course, but retain the same Formation bearing.

Note.—One Compass signal will denote the new course.

Signal 15. Change Formation bearing and course 16 points, by method in page 24, Diagram XX.

Signal 16. Change Formation bearing and course 16 points, by each column turning in succession, as in page 25, Diagram XIX.

Signal 17. Reverse leaders will act as Leaders

Signal 18. The Port column will act as Starboard, the Starboard column as Port.

Signal 19. The columns will change places by passing through each other; each ship passing the corresponding ship of the other columns, on her port hand.

Signal 20. The ship denoted is the pivot ship, or the ship on which the squadron, are to form or turn.

Note.—The ship denoted is to hoist a distinguishing flag.

APPLICATION OF SIGNALS.

EXAMPLE 1. DIAGRAM I.

THE squadron being in an unformed, or scattered state, it is required to form in Order of steaming on the centre in three columns, course and Formation bearing being West.

Hoist Signal 7, accompanied by Compass signal West.

Execution.—The Leader of the Centre proceeds slowly upon the "indicated Formation bearing West;" the other ships of the Centre, form astern of her in line ahead.

The Leaders of the Starboard and Port columns, take up their Cross formation bearings, at the proper distances from the Leader of the Centre. The ships of the Starboard and Port columns, form astern of their Leaders.

EXAMPLE 2. DIAGRAM XXVII.

The squadron being formed in three columns, is required to form in line ahead upon the Centre column, retaining the same course and Formation bearing.

Hoist Signal 2. No Compass signal is required, as neither course nor Formation bearing, is to be changed.

Execution.—The Centre column proceeds slowly; the Leaders of the Starboard and Port columns, will shape their courses by Rules given in pages 27 and 31, and, with their columns, will steam into station in line with the Centre column.

EXAMPLE 3. DIAGRAM XXVIII.

The squadron being formed in line ahead, is required to form the Order of steaming in three columns, on the Van or Starboard column; the Formation bearing and course, to remain as before.

Hoist Signal 6.

Execution.—The Starboard column proceeds slowly.

The Leaders of the Centre and Port columns, alter course to Port, by the directions in page 27, and take up their Cross formation bearing from the Leader of the Starboard column. The ships of the Centre and Port columns, steer parallel to their leaders.

EXAMPLE 4. DIAGRAM XXIX.

The squadron being formed in three columns, course and Formation bearing South; it is required to form on the Centre in one column, Formation bearing West, but retaining the same course, viz. South. The squadron will be in line abreast.

Hoist Signal 2.

Upper Compass signal West.
Lower „ „ South.

Execution.—The Leader of the Centre proceeds slowly.

The Leaders of the Port and Starboard columns, open out, on the New formation bearing West, a sufficient distance to allow the ships of the Starboard and Centre to form.

The ships of each column range up on the port beam of their Leaders, and at their proper distances by Rule in page 32.

In this way, the squadron may be formed in single line, on any Formation bearing, and steering any course; and so be ready to form line ahead, by altering course together to the Formation bearing.

If it had been required to form single line, Formation bearing N.W., course South, it would have been better to have hoisted Signal 1, as the Starboard column would have been the easiest to form on, the Leaders of the Centre and Port opening out.

EXAMPLE 5. DIAGRAM XXX.

The squadron being formed in line ahead, course and Formation bearing West, it is required to form the Order of steaming in three columns, Formation bearing and course N.N.E.

Hoist Signal 6, accompanied with one Compass signal N.N.E.

Execution.—The Leader of the Starboard column alters course to N.N.E., and is followed in succession by her column. When all the ships of this column are on the New formation bearing, the column proceeds slowly.

The Leader of the Centre, when she is clear of the sternmost ship of the Starboard column, will steer for her station, on the Port beam of the Leader of that column.

The Leader of the Port, will do so when she is clear of the sternmost ship of the Centre column.

These Leaders will shape their courses by Rule the 2nd and by the observations in pages, 27, 28, 29.

The ships of the Centre and Port columns form on their Leaders. If the change of Formation bearing and course had been to Port, the three leaders would have altered course together, followed by their columns.

If the change had been more than 8 points to Port, say to S.E., the Rear column would have been the easiest to form on, and Signal 8 would have been made. The Leaders of the Centre and Van would have altered course, with the Leader of the Rear, and have taken up their Cross formation bearing from her.

EXAMPLE 6. DIAGRAM XXXI.

The squadron being formed in line ahead, course and Formation bearing West, it is required to form Order of steaming in three columns, on the Starboard column.

Formation bearing N.E., course to remain the same, West.

Hoist Signal 6.

Upper Compass signal N.E.
Lower „ „ West.

Execution.—The Leader of the Starboard column proceeds slowly, the ships of her column alter course to Port, and bring her on the New formation bearing by Rule the 1st.

The Leaders of the Centre and Port columns, alter course to Starboard and push on, until they bring the Leader of the Starboard column on the New cross formation bearing, N.W.—S.E. To do this, they will shape their courses by Case 1 of the Formation Circle, if the rate of the Starboard column be inconsiderable; and by Case 3 if that rate be considerable.

The ships of the Centre column form on their Leader, when they are clear of the Leader of the Starboard column.

The ships of the Port column do likewise, when they are clear of the Leader of the Centre.

Signal 17 may now be made as Reverse leaders are leading.

EXAMPLE 7. DIAGRAM XXXII.

The fleet being in three columns, Formation bearing and course West. It is required to change the Formation bearing to S.W. without changing the course, except to perform the evolution.

The Leader of the Port column must be the pivot to form on.

Hoist Signal 13, accompanied with Compass signal S.W.

Execution.—The Leader of the Port column proceeds slowly. The Leaders of the Centre and Starboard columns, take up the New cross formation bearing N.W.,—S.E. from her by Rule the 1st.

The ships of all three columns form on their Leaders.

If the New formation bearing were N.W., the Leader of the Starboard column would be the ship to form on; but the ships of that column would wait until the Centre and Port columns had passed, before they proceeded to take up the New formation bearing from their Leader.

The manœuvre in either case may be performed more easily, if there be sufficient space, by first changing Formation bearing and course, as in page 23; and, when the squadron is formed on the New formation bearing, by altering course together to West.

By Signals 12, 13, and 14, the squadron may be moved in any direction. (See page 23.)

If Signal 19 be made, the columns, in fine weather, might steer towards each other; but generally it will be safer for all columns to steer in the same direction. One column should proceed slowly, steering a course indicated by its senior officer, whilst the ships of the other column pass through the intervals.

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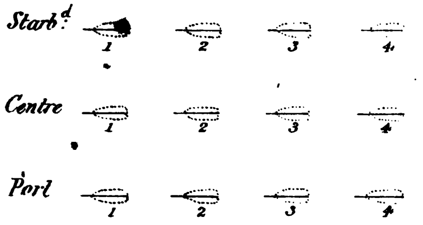
Pl. 1.

Diag^{m}. 1.

Formation bearing West.

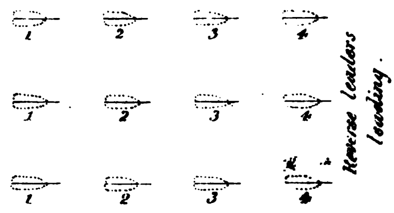
Course West.



Diag^{m}. 2.

Formation bearing West.

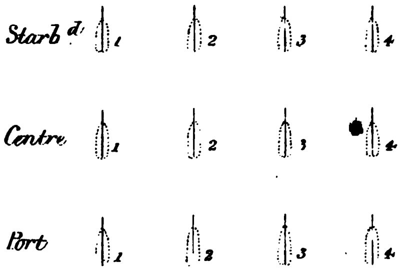
Course East.



Diag^{m}. 3.

Formation bearing West.

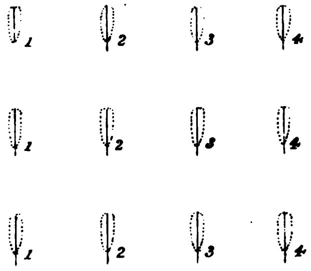
Course North.



Diag^{m}. 4.

Formation bearing West.

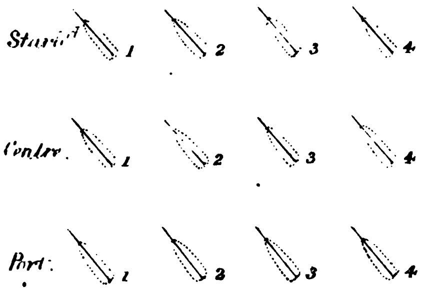
Course South.



Diag^{m}. 5.

Formation bearing West.

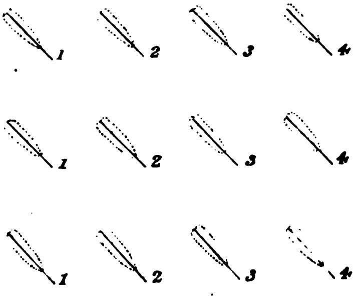
Course N.W.



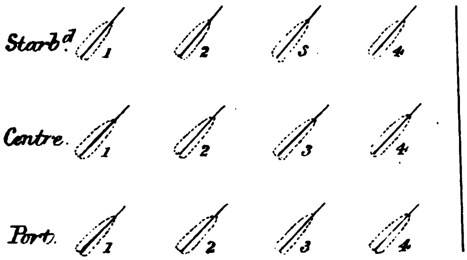
Diag^{m}. 6.

Formation bearing West.

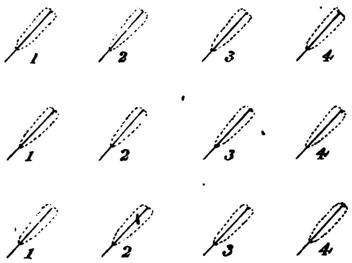
Course S.E.



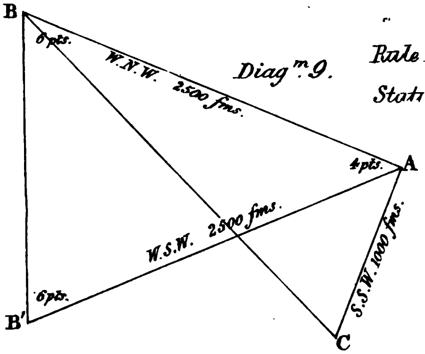
Diag^{m}. 7.
Formation bearing West.
Course N.E.



Diag^{m}. 8.
Formation bearing West.
Course S.W.

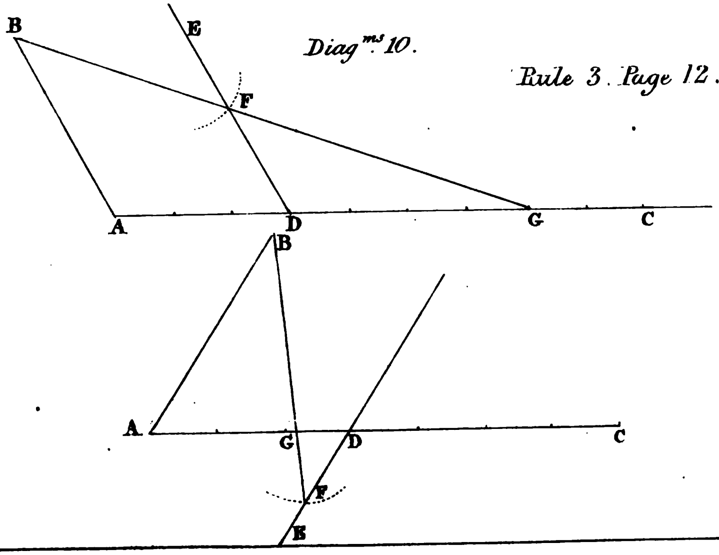


Diag^{m}. 9.



Rule 1 & 2 for taking up Station. Page 11.

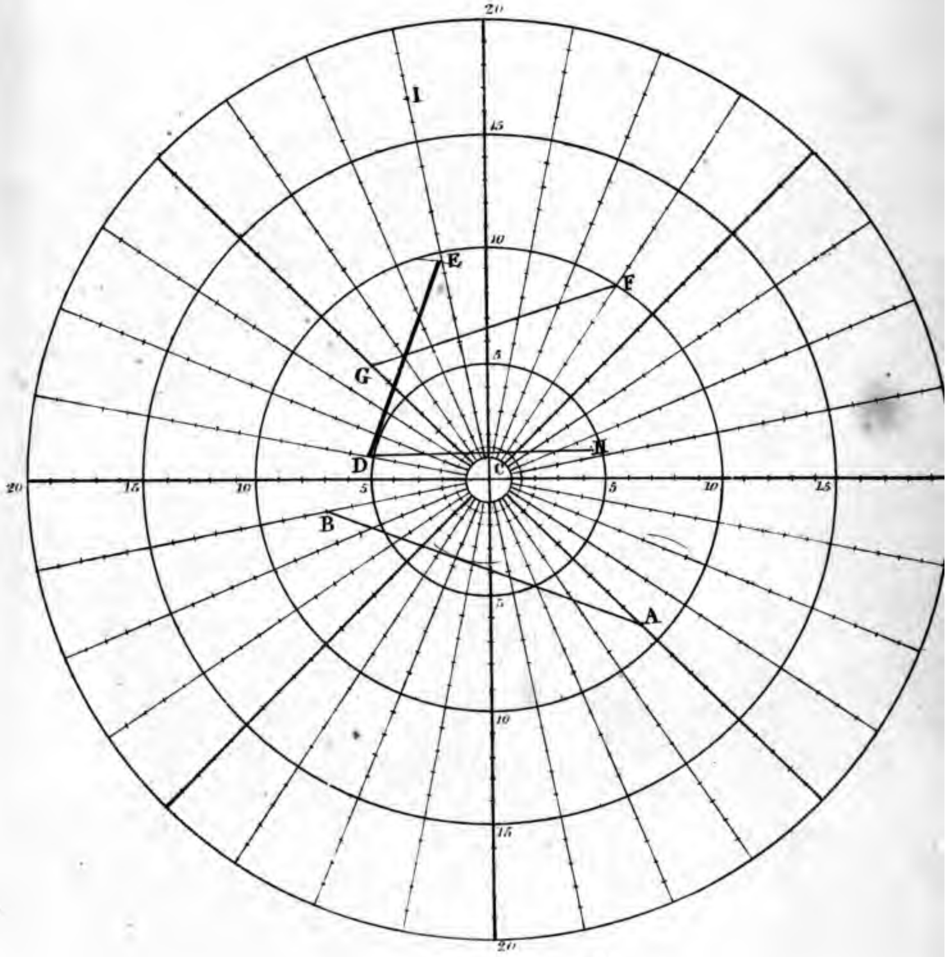
Diag^{ms}. 10.



Rule 3. Page 12.

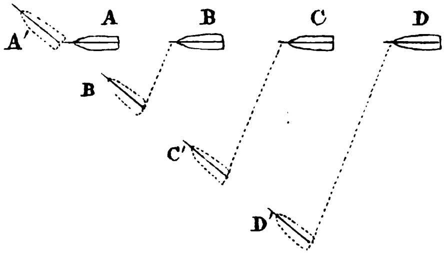
Diag^{m}. II.

The Formation Circle

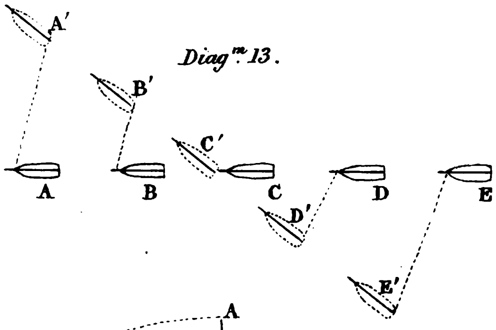


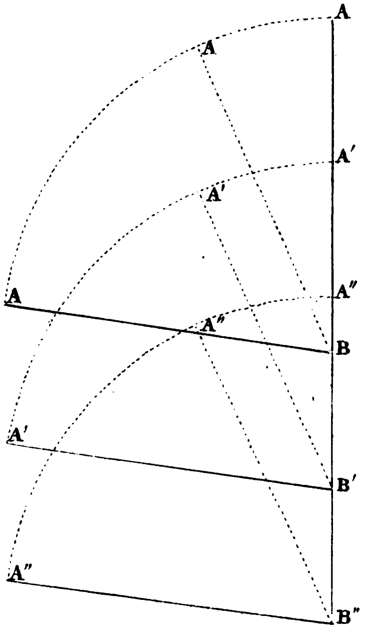
Diag^{m}. 12.

To change Formation bearings. Page 20.



Diag^{m}. 13.



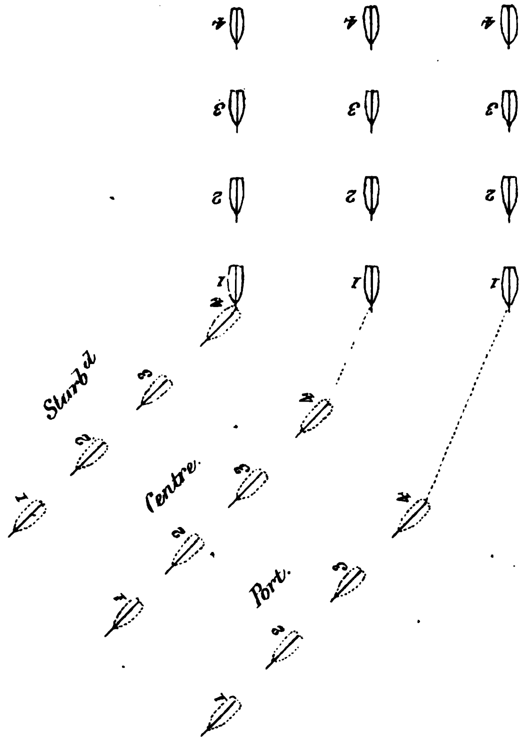


Diag^{m}. 14.

Shewing that in changing Course and Formation bearing the leaders must open out. Page 21.

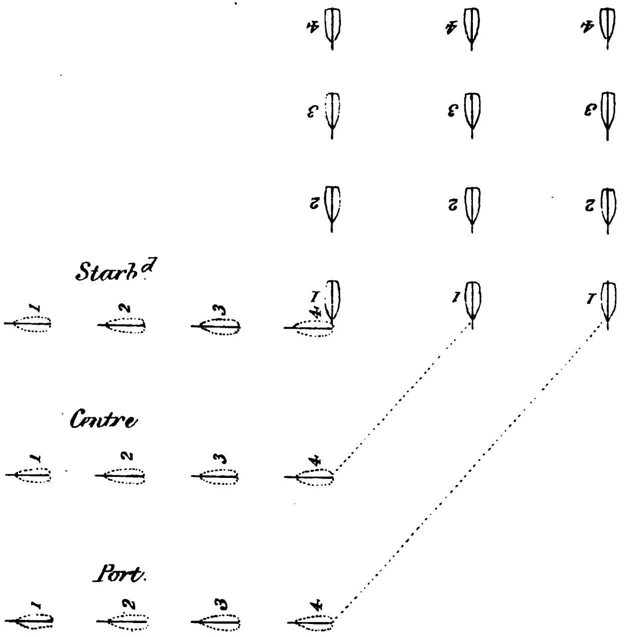
Diag^{m}. 15.

Changing Course & Formation bearing 4 points from South to S.W. Page 23.



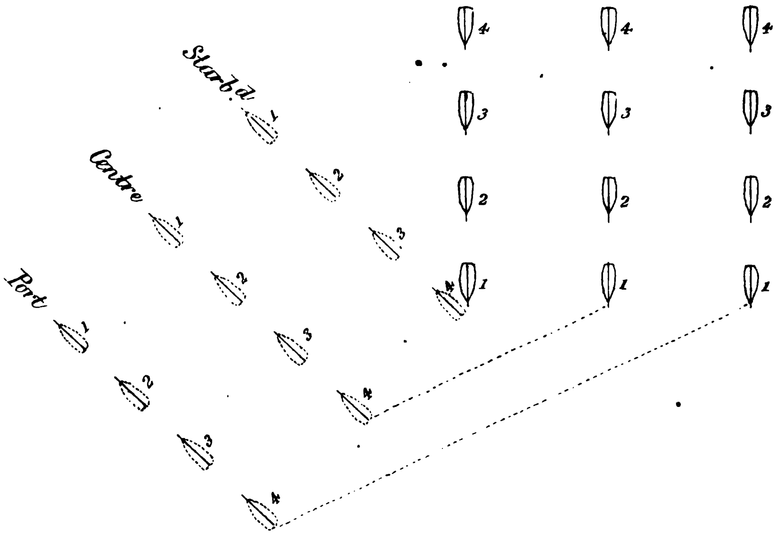
Diag^{m}. 16.

Changing Course & Formation bearing 8 points from South to West. Page 24.



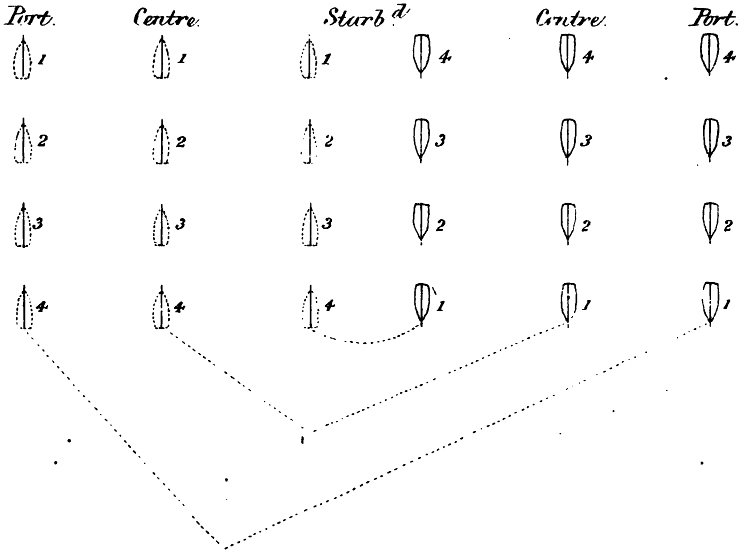
Diag^m. 17. Page 24.

Changing Course & Formation bearing 12 points from South to N. W.



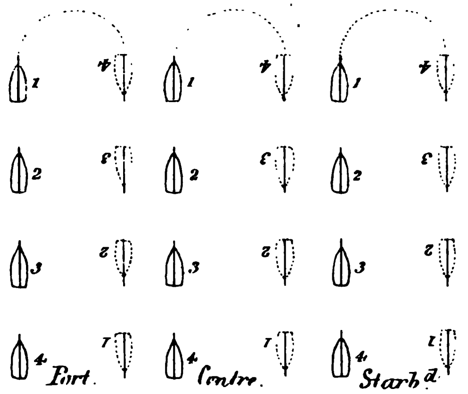
Diag^m 18. Page 24.

Changing Course & Formation bearing 16 points from South to North.



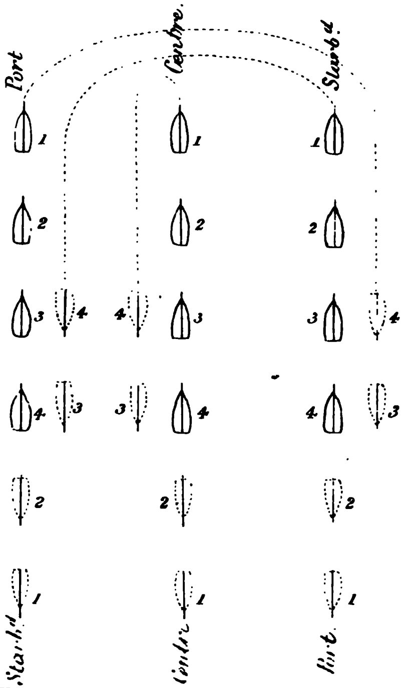
Diag^{m}. 19. Page 26.

Changing Course & Formation bearing 16 points.
Port-column comes on Start-beam of the Centre.
Start column on the Port beam.

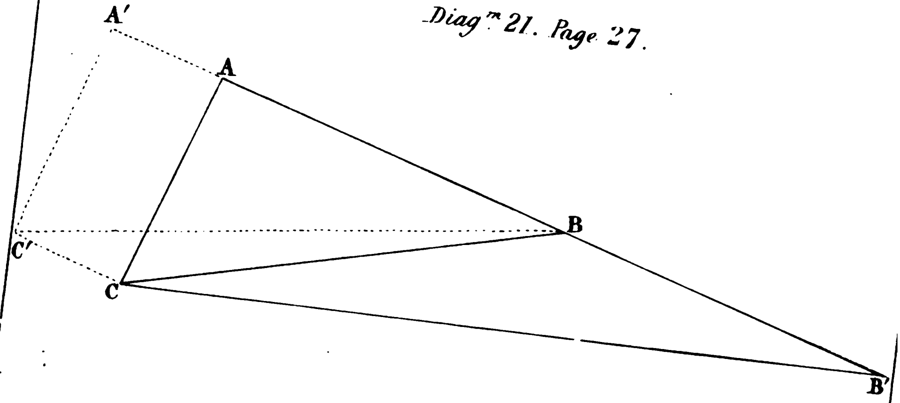


Diag^{m}. 20. Page 24.

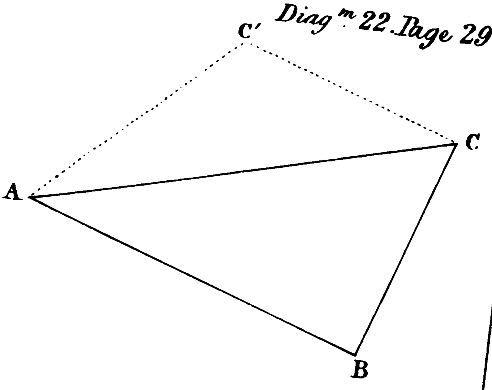
Changing Course & Formation bearing 16 points - preserving order of sailing.



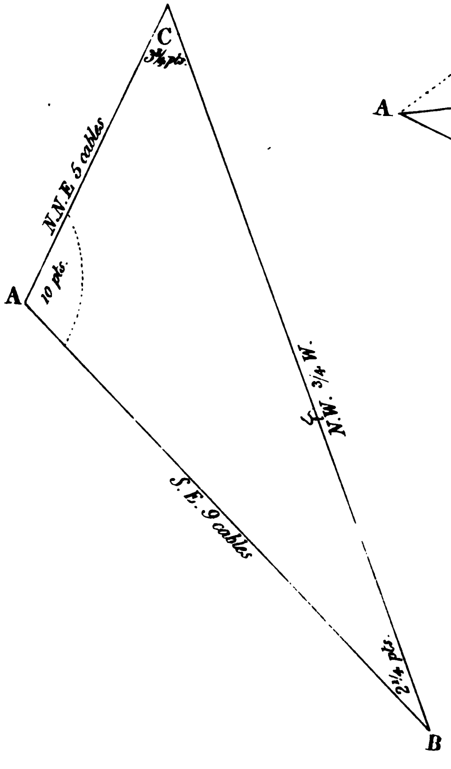
Diag^m 21. Page 27.



Diag^m 22. Page 29.



Diag^m 23. Page 35.



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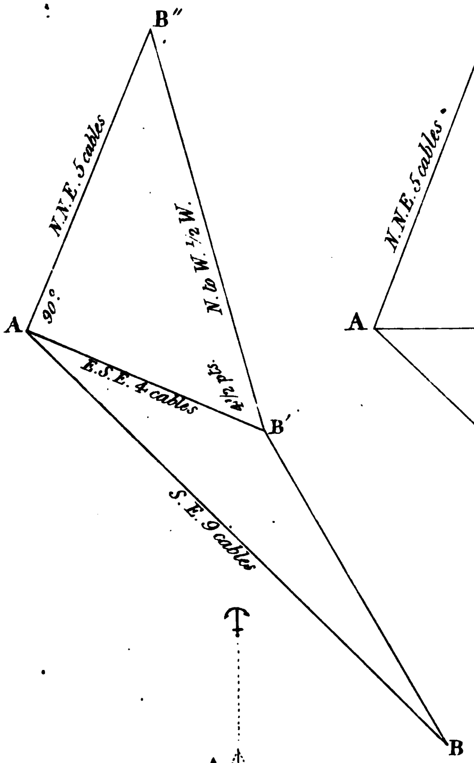

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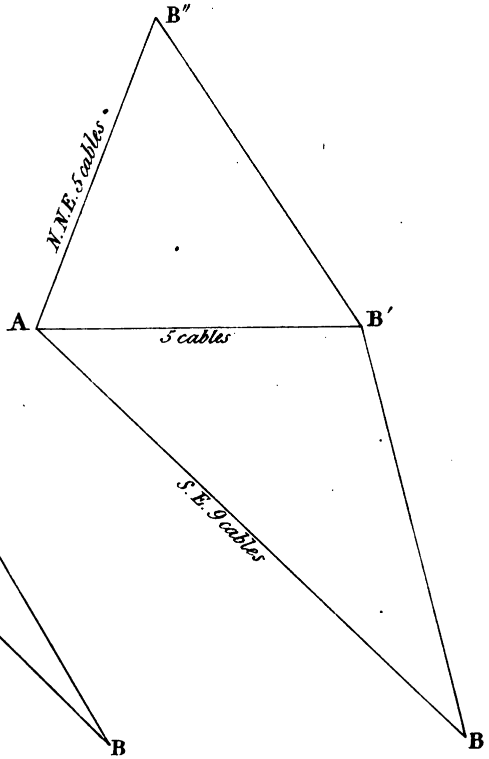

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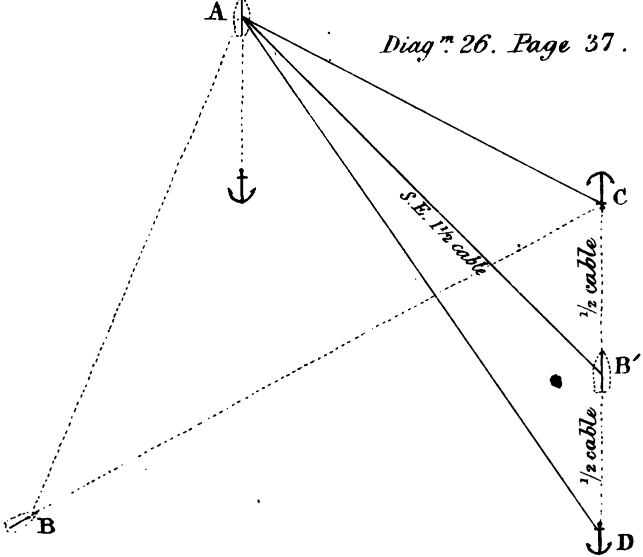
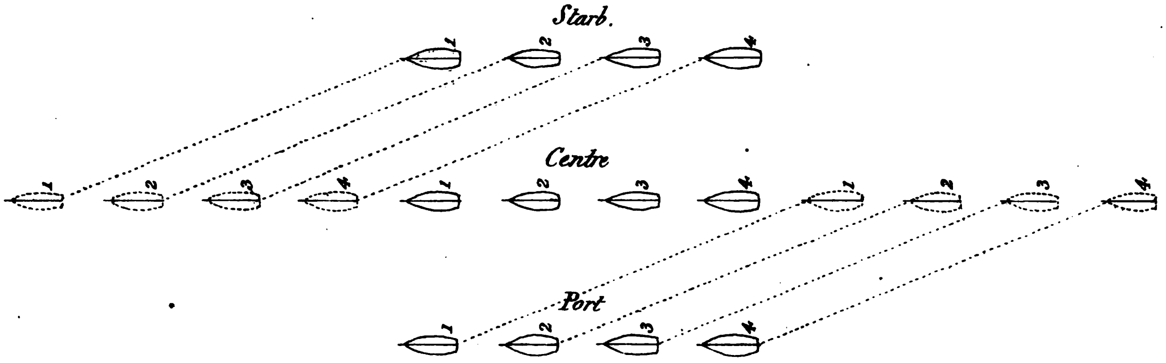
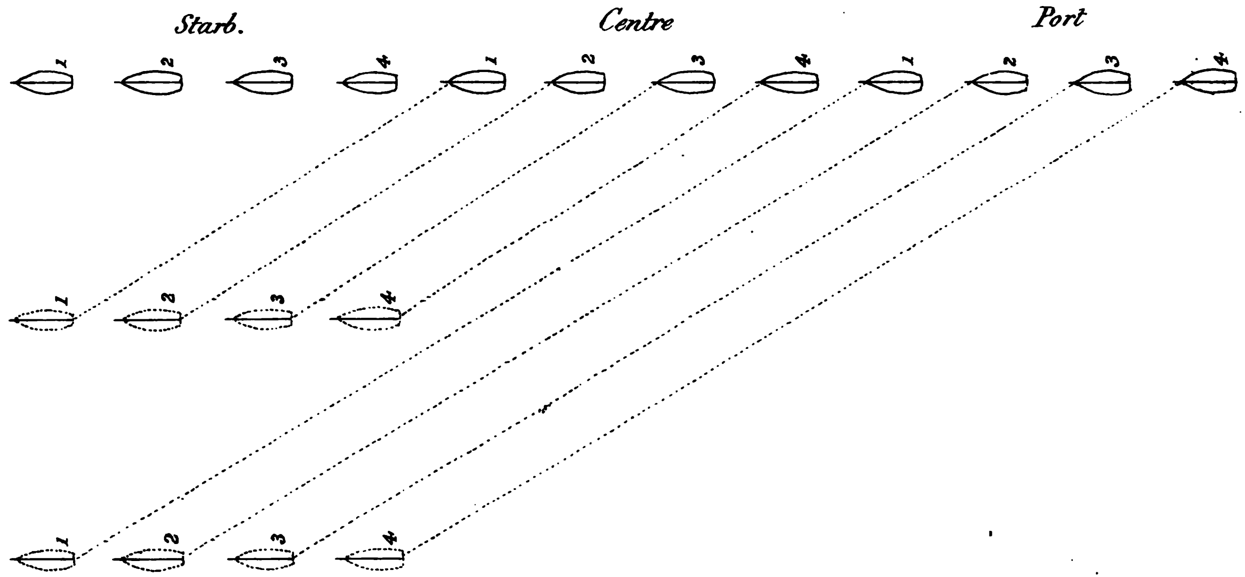


Diag^{m}. 27. Page 56.



Pl. 11.

Diag^m. 28. Page 57.



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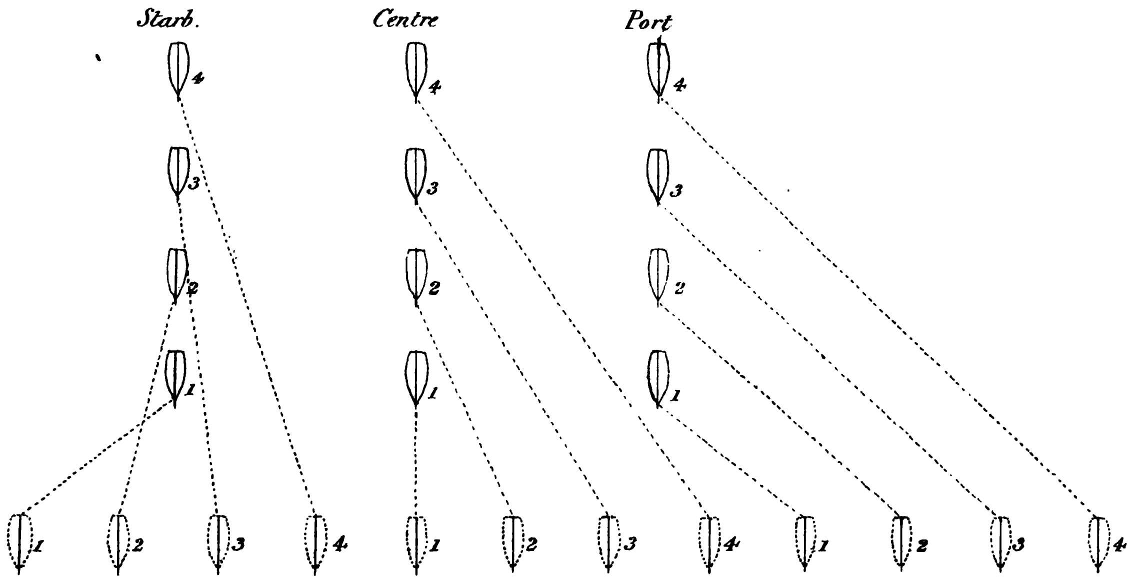

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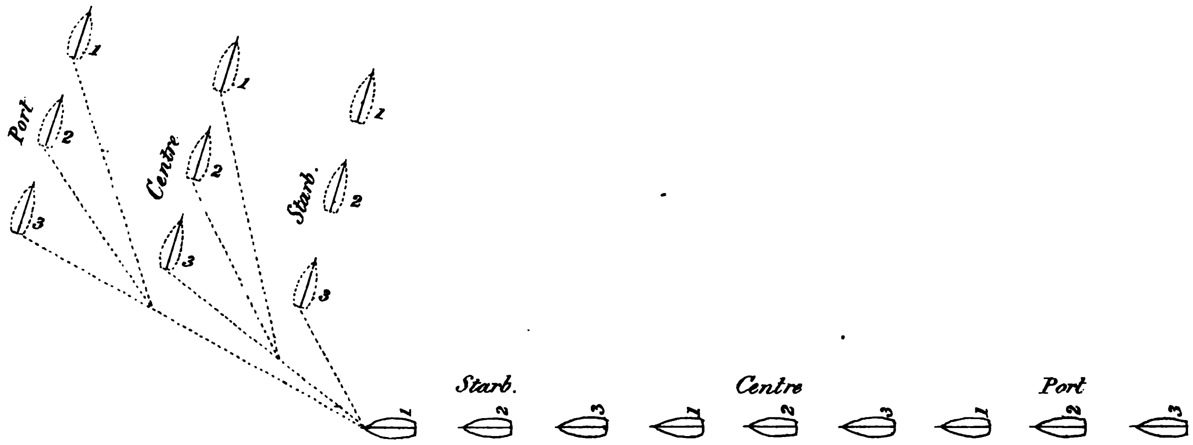
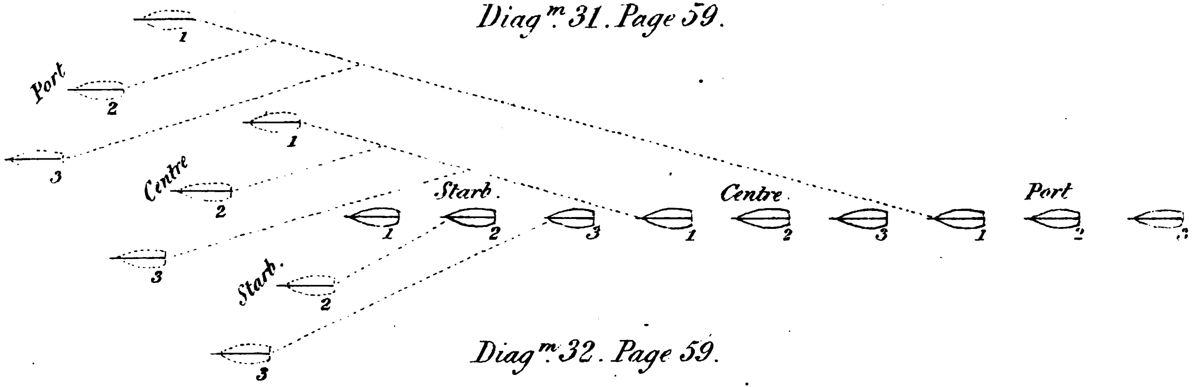
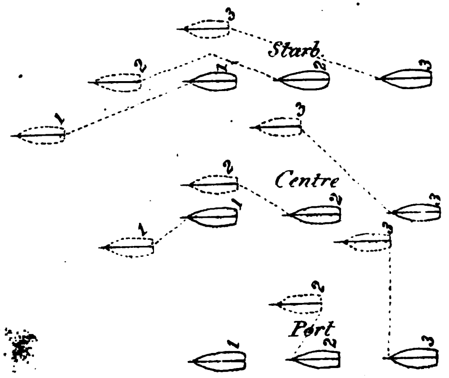


Diag^m. 31. Page 59.



Diag^m. 32. Page 59.



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